

a change of such magnitude. These considerations are well understood in the colonies. Thus on p. 64 of the report now under consideration we find the statement:—"The United Kingdom is conservative and unless this is forced upon them it will never be adopted."

The question of the adoption of the metric system has not been brought forward in our colonies merely from considerations of relative practical utility or of relative scientific perfection, but owing to difficulties experienced in commerce with foreign countries, and to the prospect of continual loss of trade. Until the United Kingdom, their very good customer, takes the lead, they cannot afford to make the change. If their loyalty in respect of weights and measures is thus in great measure enforced upon them, it is none the less pathetic. Every day it is more effectually shutting them out from the new markets which are of vital importance to their commercial prosperity. So long as the public at home are taught that the claims of the metric system are based chiefly on its decimal notation, so long will they remain unconvinced of the necessity for adopting it. On the other hand, if the true issues are placed before them, they are not likely to be inconsiderate in a matter which involves the interests of their most important colonies.

NOTES.

THE following is the text of the address presented by Sir Arch. Geikie for the Royal Society at the recent celebration of the quatercentenary of the University of Aberdeen:—The Royal Society of London for Promoting Natural Knowledge sends cordial greetings to the University of Aberdeen on the auspicious occasion of the celebration of the four hundredth anniversary of its foundation. The Royal Society would more specially desire to record its sense of the importance of the services which the University has rendered to the progress of science. From its infancy the society has been privileged to count among its fellows distinguished professors and graduates of Aberdeen, and this close and valuable association still continues. It is a gratification to recall that the illustrious family of the Gregorys, which for some two centuries shed so much fame upon the University and upon Scotland, were from the beginning intimately linked with the Royal Society. James Gregory early reached such eminence in mathematical and astronomical research that in 1668, when he was only thirty years of age, he was elected a fellow, six years after the incorporation of the society. His invention of a reflecting telescope, of which he had first conceived the idea, prompted Newton to proceed in a similar direction in order to evade the difficulties of chromatic dispersion, and led to mutual regard and friendly cooperation. To his brother David Gregory, who had the distinction of being one of the earliest effective promoters of the Newtonian philosophy, the society is also indebted for important communications published in early volumes of the Philosophical Transactions. The obligations of physical science to Aberdeen did not end with the lives of the masters of the seventeenth century, for within living memory the University has numbered among its professors the world-renowned pathfinder James Clerk Maxwell. To the progress of the study of medicine the same remarkable family of Gregory continued during successive generations to make important contributions, while the fame of the medical school was in more recent years extended by Allen Thomson. In natural science the well-remembered names of John Fleming, William MacGillivray, and James

Nicol appear among those who have sustained the scientific reputation of Aberdeen. But it is not only with the scientific side of culture in the University that the Royal Society has had interesting links. It is a pleasure to remember that Thomas Reid, the father of Scottish philosophy, whose fame is one of the fairest pearls in the chaplet of the northern University, contributed to the Royal Society in 1748 an essay upon quantity. In remembrance of these varied associations of the past, and with sincere wishes for their continuance in the future, the Royal Society gladly adds its felicitations to those which will this year come from all civilised countries to the University of Aberdeen.

WE regret to learn of the death on Wednesday, October 10, at the age of fifty-five, of Mr. Herbert Rix, assistant secretary of the Royal Society from 1885 to 1896. Mr. Rix resigned his post ten years ago, finding that his strength would no longer sustain the greatly increased anxiety and burden of his office. He was already suffering from a weakness of the heart, which gradually developed during the following years. A year ago he was obliged to relinquish nearly all active work, and the shock of his wife's death last August, as the result of an accident, had a disastrous effect upon him. Mr. Rix entered the service of the Royal Society in 1879, as clerk under the late Mr. Walter White, then assistant secretary, whom he succeeded six years later, his service to the society thus extending over seventeen years. During this period a great extension of the activity of the society occurred, entailing a large increase in the responsibilities of the executive and in the amount of work thrown upon the office. Mr. Rix's bent was in the direction of the moral rather than of the exact sciences, but he gave the best energies of a well-trained mind to the arduous duties of his position, and the simple directness of his character, his high principles, and his kindly nature made him popular with all who came in contact with him. After retiring from the assistant secretaryship he retained for some years the position of clerk to the Government Grant Committee, and continued up to the time of his death to act as secretary to the Lawes Trust Committee. He devoted much of his latter years to the study of comparative religion, and was a frequent lecturer on ethical subjects. He was a graduate of London University.

THE board of directors of the great manufacturing firm of Kynoch (Ltd.) has decided to introduce the metric system of weights and measures into all their works. A small committee has been appointed to consider the details of the change and to provide the necessary instruments, and as soon as the committee reports the change will be made. All the weights and measures used by the firm, whether lineal, square, or cubic, will be metric. For money calculations the pound sterling will be adopted as the unit, and this will be subdivided decimally.

A REUTER telegram of October 11 from Basse-Terre, Guadeloupe, reports that a violent eruption of Mont Pelée has caused a shower of ashes to fall over the south-east of Guadeloupe.

A NEW ZEALAND international exhibition is to be held, under the auspices of the New Zealand Government, at Christchurch, Canterbury. The exhibition will be opened on November 1, and will be terminated in April, 1907. A special feature is to be made of the representation of Maori life, and Poi dances and hakas will be arranged from time to time.

THE annual meeting of the Yorkshire Naturalists' Union will be held at York on Saturday, December 15. Mr. W. Eagle Clarke, of the Royal Scottish Museum, will deliver his presidential address, entitled "Antarctic Bird-life," which will be illustrated by a series of lantern-slides from photographs taken during the National and Scottish expeditions. Further details can be obtained from Mr. T. Sheppard, the honorary secretary of the society, at the Museum, Hull.

A FRUIT growers' conference will be held at the South-Eastern Agricultural College, Wye, on Wednesday, November 7. The chair will be taken by Mr. Laurence Hardy, M.P., and an introductory address will be given by the principal of the college. The subjects to be considered at the conference will be:—Methods of planting, S. U. Pickering, F.R.S.; strawberry culture, W. P. Wright; treatment of American blight, F. V. Theobald; and some fungus diseases of orchards and plantations, E. S. Salmon.

WE learn from the *Times* that unavoidable delay in the completion of the latest addition to the Carnegie Institute building at Pittsburg, Pa., has made it necessary to change the date for opening the annual international exhibition from November 1 of this year to April 11, 1907. This change has been made because the trustees desire the exhibition to be held in conjunction with the opening and dedication of the building, which has been enlarged during the past two years to about six times its original size. A number of eminent men, representing the scientific, artistic, and literary organisations and institutions of the world, will be present at the dedication.

THE new session of the Royal Geographical Society will be opened on November 12, when a paper will be read on North-Eastern Rhodesia by Mr. L. A. Wallace. On November 19 Mr. J. Stanley Gardiner will deal with the subject of the Seychelle Islands, and on December 10 an account of irrigation in the United States will be given by Major John H. Beacom. Other provisional arrangements are as follows:—Polar problems, Dr. Fridtjof Nansen; through Central Africa from the west coast to the Nile, Lieut. Boyd Alexander; nine years' survey work in northern China and Mongolia, Colonel A. W. S. Wingate; a journey through Central Asia to northern China, Major C. D. Bruce; the north magnetic pole and the north-west passage, Captain Amundsen; aboriginal India, Colonel Sir T. H. Holdich, K.C.M.G.; a journey from Yunnan to Assam, E. C. Young; the story of London maps, Laurence Gomme; the evolution of the map of Africa, Edward Heawood; inland waterways, G. G. Chisholm; the Taupo volcanic region, New Zealand, J. Mackintosh Bell. At one of the meetings in the early part of next year an authoritative account will be given of H.R.H. the Duke of the Abruzzi's expedition to Mount Ruwenzori.

IN 1904 an advisory committee was appointed by the Secretary of State for India to inquire into some of the problems concerning plague, and the first function of the advisory committee was to appoint a working commission which has been investigating the disease in India ever since. A series of reports on the work already accomplished has just been published in a special number of the *Journal of Hygiene* (vi., No. 4). The first half of this contains the results of experiments on the transmission of plague by fleas. Guinea-pigs allowed to run free in plague houses in 29 per cent. of cases contracted plague, but if the animals were kept screened by fine gauze, so that fleas had no access, they remained healthy. Fleas caught on

rats dying of plague and transferred to healthy animals transmitted the disease. The Hon. N. C. Rothschild contributes a paper on the species of flea found on rats. Experiments on the infectivity of native floors grossly contaminated with *B. pestis* seem to show that they do not remain infective for more than twenty-four hours. In plague-infected rats as many as 100,000,000 bacilli may be present in 1 c.c. of blood, and a few in the urine and faeces. Chronic plague in rats was noted in six instances at a season of the year when neither human nor rat plague existed, suggesting that this possibly is the means by which the infection is propagated from season to season.

THE contents of the first part of the nineteenth volume of the Proceedings of the Royal Society of Victoria comprise descriptions of new and little-known marine molluscs from the adjacent sea, by Mr. J. H. Gatliff, and of decapod crustaceans from the same, by Messrs. S. W. Fulton and F. E. Grant, together with the first instalment of a census of the Victorian representatives of the last-named group by the same writers.

THE papers in the September issue of the *American Naturalist* are chiefly interesting to histologists and specialists. In the first Prof. A. W. Weyssse and Mr. W. S. Burgess contribute an elaborate account of the histogenesis of the retina, summarising their conclusions at considerable length in tabular form. The marine copepod crustaceans of Rhode Island receive attention at the hands of Mr. L. W. Williams, while Mr. R. H. Howe discusses the lichens of Mount Monadnock, New Hampshire.

ANOTHER of those emendations in nomenclature which are rapidly tending to make zoology an impossible science to all save the specialists in particular branches appears in a paper on the "digger-wasps" of North America and the West Indies, forming No. 1487 of the Proceedings of the U.S. National Museum. According to the author, Mr. H. T. Fernald, none of the insects which have been included in the genus *Sphex* during the past century properly belongs to it. Consequently the species and subgenera so long included under that generic designation now appear under the title *Chlorion*, while *Sphex* is made to include those hitherto known as *Ammophila*, a further change being the substitution of the subfamily *Chlorioninae* for the original *Spheginae*, and the transference of the latter, under the altered form of *Sphecinae*, to the old *Ammophilinae*. Fortunately (under its amended form of *Sphecidae*) the family name of *Sphegidae* is retained for the whole group. The author appears to have made an exhaustive study of that section of the group he classifies as *Chlorioninae*, having examined, and when necessary re-described, all the type-specimens in American collections.

TO the June issue of the Proceedings of the Philadelphia Academy Mr. H. W. Fowler contributes the first part of a paper on American fresh-water "heterognathous" fishes, or those usually classified under the family name *Characinae*. In the author's opinion they should form two families, for which the titles *Erythrinidae* and *Characidae* are adopted. Apparently, however, there is no justification for the use of the name *Characinae* (or *Characidae*), since there is no such genus as *Characinus* or *Characus*. If but one family is recognised the name *Erythrinidae* may be employed, but if two groups are recognised a new title (such as *Citharinidae*) is required. It may also be noticed that the author does not recognise the preoccupation of *Chirodon* (or *Cheirodon*) by *Chirodus*. The author has had access to all Cope's type-specimens,

and proposes a number of new names, and he is of opinion that the information he conveys with regard to rare or nominal species will be appreciated by naturalists.

MUSEUM technique is the leading feature of the five articles (four of which were read at the recent Bristol conference) in the September issue of the *Museums Journal*. In the first, and perhaps most generally interesting, Dr. Sorby discusses the mode of forming a collection to illustrate the origin and structure of rocks. The material of rocks, such as sands and clays, should form the starting point. This should be followed by illustrations of different modes of deposition and sorting, while the consolidation of deposits by infiltration, or by removal and replacement of material, claims the next place. The formation of concretions, and various mechanical changes, culminating in slaty-cleavage, complete the illustration of the genesis of aqueous rocks, after which come illustrations of the formation of the igneous series. The next three articles deal respectively with the exhibition of coins, models of Protozoa, and the hanging and care of pictures. In the fifth Dr. J. E. Duerden describes a new method of preserving entire tortoises which deserves the best attention of museum curators, the specimens treated by this method having, it is stated, a remarkably life-like appearance.

THE report of the working of the Government Museum at Madras for the past year is a record of steady progress. The great collection of prehistoric antiquities recovered from interments in the Nilgiri Hills by Mr. J. W. Brecks and others has now been increased by a splendid series of bronzes, iron weapons and implements, pottery, and human bones from the excavations at Aditanallur, in the Tinnevely district, conducted by Mr. A. Rea, and these have been arranged in a new gallery built for their reception. Mr. Thurston, who usefully combines the duties of curator with those of director of the Ethnographical Survey, has made his usual tours among the jungle tribes, and has collected many curious implements, skulls, and other specimens. He has made a special anthropometric survey of that little-known tribe, the Chenchus of the Nallamalai Hills. His materials now enable him to establish the correlation, so far as the type of head is concerned, between the people of the Canarese, Maratha, and Telugu area, that is to say, the north-west and north-east of the province, as compared with the Malayalam and Tamil dwellers in the south. This is interesting in connection with Mr. Risley's speculations on the brachycephalic Marathas. During these expeditions he used for the first time an Edison's phonograph, by which he was able to secure records of tribal songs and music. Duplicates of these are to be sent to Mr. C. S. Myers for the Museum of Comparative Music at Cambridge. Mr. Thurston finds the phonograph an admirable means of conciliating timid and suspicious jungle folk, who fear the ordinary anthropometric methods. No travelling anthropologist, he says, should be without it.

A COLLECTION of diagnoses of new Philippine ferns, prepared by Mr. E. B. Copeland, forms the second supplement to vol. i. of the *Philippine Journal of Science*. The most striking novelty is an epiphytic plant of the nature of a *Drynaria*, receiving the name of *Thayeria cornucopia*, that is said to have a unique humus-collecting structure; each leaf forms a complete receptacle, enclosing the humus on all sides. New species are described for a number of genera, including *Alsophila*, *Cyathea*, *Trichomanes*, *Nephrolepis*, *Plagiogyria*, &c. The writer revives the genus *Schizostege*, assigned to *Cheilanthes* by Baker and to *Pteris* by Christ and Diels, for two new species.

OWING to the want of knowledge of the complete life-histories of many of the Uredinales, the classification of the group is a matter of some difficulty. Prof. J. C. Arthur presented an outline of a system of classification to the International Scientific Congress of Botanists at Vienna in 1905, that is published in their "Resultats Scientifiques." Three orders, *Coleosporiaceæ*, *Uredinaceæ*, and *Æcidaceæ*, are defined according to the nature of the teleutospores and their germination. Suborders are determined by the position which the spores occupy in the tissues of the host plant. Finally, the genera in each suborder are grouped according to the development of one or more of the æcidio-, uredo-, and teleuto-spore stages.

IN the annual report for 1905-6 of the botanic station, agricultural school and experiment plots in St. Lucia, the superintendent, Mr. J. C. Moore, refers to tapping trials made on trees of *Castilloa elastica* that point to a yield of 2 lb. of cured rubber for mature trees. The agricultural instructor, Mr. G. S. Hudson, devotes a considerable portion of his report to the subject of cacao, detailing the results obtained on experiment plots. A new hybrid plant has been produced by crossing *Theobroma pentagona* with *Theobroma cacao*. On the debated question of shade or no shade for cacao, Mr. Hudson says that shade and shelter are obviated partly in Grenada by close planting, but he recommends for St. Lucia a light shade of Para rubber trees or *Erythrina indica*, and wind belts of *Inga vera*.

WE have received several of the recent issues of the *Boletín del Ministerio de Fomento* of Peru, a well-edited journal issued by the Department of Public Works. It contains much valuable information regarding the railways of the Republic.

AN admirable coloured geological map of Queensland (Publication No. 206), on a scale of forty miles to the inch, has been received from the Geological Survey of Queensland. It has been compiled under the supervision of Mr. B. Dunstan, acting Government geologist, by Mr. H. W. Fox, and shows the mineral localities clearly marked in red.

THE Transactions of the Institution of Engineers and Shipbuilders in Scotland (vol. xlix., part vii.) contains a valuable paper on equimomental systems and their use in applied mechanics, by Mr. R. F. Muirhead. The value of this principle has hitherto been regarded by engineers as of academic interest, and in developing the principle and in reducing the results to a form suitable for practical application the author has done much to reduce the time and labour of engineering calculators.

THE annual memorandum issued by the chief engineer of the Manchester Steam Users' Association deals with several subjects of importance to engineers, such as steam-pipe explosions, the brittleness of steel plates, and boiler tests. Many steam pipes are badly designed, and may explode at any time. They could, however, be made safe without much expense; and in order to encourage those dealing with these matters to study the subject, a sketch is given of a glass model which clearly shows the hammering action of water when confined in steam pipes. In the section dealing with boiler tests, particular stress is laid on the carrying out of gas analysis with the greatest possible care. If this is done, it will be possible to utilise the gas analysis for determining the chemical composition of the fuel, and for ascertaining at any instant what is the efficiency of the heating surface.

IN *Engineering* (vol. lxxxii., No. 2126) an abstract is given of a paper by Mr. A. R. Ledoux, presented to the American Institute of Mining Engineers, describing a new method of mining kaolin. Deposits in the Housatonic River district in Connecticut were being worked at a loss, owing to transport difficulties and to increase in expenses caused by the dip of the vein, which ran at an angle of about 50 degrees from the vertical, between gneiss and hornblende schist, and a footwall of rock. The material is therefore now mined by well, by which method the crude material is obtained with but little of the overburden, &c. The wells are from 50 feet to 198 feet deep, and contain a 4-inch, and, inside this, a 2-inch pipe. These go down gradually into the clay. Water at a pressure of about 40 lb. per square inch is forced through the smaller pipe, and on its passage upward carries with it about 5 per cent. of solid matter, of which 75 per cent. is pure kaolin.

MUCH valuable information regarding the mineral resources of Peru continues to be got together in the admirable series of monographs issued by the Government Corps of Mining Engineers. In *Boletín* No. 29 Mr. Federico G. Fuchs describes the copper-bearing region in the vicinity of Ica and Nazca. His detailed description, covering 100 pages, and his geological map show the importance of a mining centre that has long been neglected. In *Boletín* No. 35 Mr. Enrique I. Dueñas reviews the mineral resources of Jauja and Huancayo. At the present time no mines are being worked in these provinces, but the author shows that they are rich in coal, asphalt, copper, silver, gold, molybdenum, and iron. In *Boletín* No. 36 Mr. Luis Pflücker describes the iron-ore deposits of Aija and Calleycancha. The ore, which occurs in veins, is of great purity and richness, but the absence of fuel is, in the case of the Aija deposits, unfavourable to their development. The Calleycancha veins are more promising owing to their proximity to the Mancos coalfield.

THE address delivered by Mr. James Adamson, hon. secretary to the Institute of Marine Engineers, on October 1, dealt in a scholarly manner with the advantages of a technical society. To the individual member, the advantages are in the direction of mental exercise, and consequent strengthening of the faculties of the mind; in the direction of finding out, in the course of discussions with fellow-craftsmen, how troubles in connection with details have been met and difficulties overcome; in the direction of social intercourse, and in exchanging experiences for mutual benefit. The advantages to the community of which the members of the society are units are in tending to improve the conditions of life and work all round; in tending to bring to the front, for the benefit of all, the latest improvements and developments; in tending to educate the general public in respect to the various aspects of the world of science, and to give the people a better understanding of things within the domain of science. The advantages to the nation are in tending to improve the trade of the country by improving methods of manufacture; in tending to improve material and minimise risk of failure; in tending to lessen insurance premiums by lessening risk of breakages, stoppages, and disablements; in tending to the adoption of improved methods, material and appliances, with better conditions of upkeep and improved views in respect to upkeep and expenditure, to get the best results in immediate running and prospective life average, thus minimising costs and economising capital outlay, with consequent advantages in competing for the traffic of the world; and in tending to re-

duce the cost of material and running expenses and repairs, enabling employers to lessen the cost of output, and make improvements in their plant to enable them to keep up to date in their works and factories with all competitors.

DURING the past few years several theories have been advanced connecting the fluorescence of organic substances with their chemical constitution. A new hypothesis is now suggested by Profs. Luigi Francesconi and G. Bargellini, based on the examination of a very large number of substances by a very sensitive method which they have devised for detecting fluorescence (*Atti dei Lincei*, series 5, vol. xv., No. 3). When a beam of sunlight is concentrated by a lens on a solution of the substance contained in a test-tube in a darkened box, and the liquid is examined from above, the cone of light appears, in the case of fluorescent substances, of a different colour from that of the solution. The striking fact has been elicited that aliphatic substances do not show fluorescence, and the same holds true of alicyclic compounds in which fatty groups predominate. It is contended that all aromatic substances are potentially fluorescent, and that a greater or less degree of fluorescence is to be attributed to the presence of certain groups or radicals which enhance or diminish the effect, each group possessing a specific influence.

THE chemical and electrical effects induced by ultra-violet light in the case of certain elements have recently attracted attention, and explanations have been advanced based on the electronic theory of matter. In this connection an investigation of the photoelectric properties of anthracene, by A. Pochettino (*Atti dei Lincei*, series 5, vol. xv., ii., p. 171), has a special significance. It has long been recognised that anthracene is highly fluorescent, and the author has recently proved that this fluorescence is accompanied by "ionisation" of the air in the neighbourhood of the anthracene. In the paper cited it is shown that the photoelectric effect of anthracene is very nearly the same as that of zinc, and that, as with zinc, the activity decays with time. This decay is, however, observed only when the layer of anthracene exceeds a certain thickness (0.02 mm.), and is attributed to the high dielectric properties of the material, which, by allowing the accumulation of a positive charge on the anthracene, arrests the ionisation effect. The original activity of anthracene which has completely lost its photoelectric properties can be restored, not only by leaving the material in darkness, but by exposing it during a few minutes to the radiation of radium, which serves to neutralise the positive charge. The decay of the activity with time is capable of being expressed by an exponential curve. Similar results are noticed in the case of phenanthrene. The resemblance of the phenomena described to those characteristic of radio-activity again raises the question, suggested by Armstrong and Lowry in 1903, of the relationship of radio-activity and fluorescence. In the case of anthracene, atomic degradation is hardly probable; the fluorescence of anthracene is, indeed, generally attributed to molecular transformation involving the change of one structure into another under the influence of light. Whether radio-activity is not also a molecular, as distinguished from an atomic, change, caused by an external stimulus, similar to, if not identical with, light, is a question which naturally arises from the analogy presented by the two cases.

AN elaborate work on salt and salt mines is in course of publication by Mr. W. Engelmann, Leipzig, for the Vienna Academy of Sciences, under the title "Das Salz: dessen Vorkommen und Verwertung in sämtlichen Staaten

der Erde." The second volume, dealing with salt in Asia, Africa, America, and Oceania, appeared recently, and the first volume, which will be concerned with Europe, is in the press.

THE prominence now given to geometrical and machine drawing in the curricula of schools and colleges has led to an increased demand for trustworthy mathematical drawing instruments. The recent catalogue, with its numerous illustrations, published by Mr. W. H. Harling, of Finsbury Pavement, London, showing the instruments he is prepared to supply, may be commended to the attention of teachers and students. In it they will find particulars concerning a great variety of instruments designed to meet every want.

OUR ASTRONOMICAL COLUMN.

COMET 1906e (KOPFF).—In addition to those published by Herr M. Ebell, elliptic elements have been calculated for the orbit of Kopff's comet by Messrs. Crawford and Champreux, and are published in No. 100 of the Lick Observatory Bulletins. They are as follows:—

Elements.

T = 1906 May 2 ^h 08 ^m 77 ^s G.M.T.	log $q = 0.230114$
Epoch = 1906 Sept. 5 ^h 67 ^m 09 ^s "	log $e = 9.716356$
M = 18 41 54.6	log $a = 0.549258$
$\omega = 19 28 44.9$	$\mu = 532''.255$
$\Omega = 261 45 23.6$	Period = 6 66633 years
$i = 8 44 09.8$	

The first decimal place of the period is determinate, and as this agrees with Herr Ebell's, who gave 6.617 years, it may be taken as fairly established. An ephemeris which accompanies the elements gives the following positions for the remainder of this month:—

Ephemeris (12h. G.M.T.).

1906	α (true)	δ (true)	1906	α (true)	δ (true)
	h. m.	° ' "		h. m.	° ' "
Oct. 17.5	22 28	5 3	Oct. 25.5	22 30	4 30
21.5	22 29	4 45	29.5	22 32	4 17

JUPITER'S SEVENTH SATELLITE.—From a telegram from Prof. Pickering to the Kiel Centralstelle, published in No. 4123 of the *Astronomische Nachrichten*, we learn that Jupiter's seventh satellite was re-observed by Prof. Perrine at the Lick Observatory on September 25. The position-angle and distance at 1906 September 25.9962 were $119^{\circ}.1$ and $2578''$ respectively.

OBSERVATIONS OF VARIABLE STARS.—Bulletin No. 8 of the Laws Observatory, University of Missouri, contains the results of some variable-star observations made at the observatory during 1905-6. A grant of five hundred dollars from the Gould fund of the National Academy of Sciences has enabled the director, Prof. F. H. Seares, to engage an assistant observer, Mr. E. S. Haynes, for this work with gratifying results.

The star B.D. +55°-2817 has been shown to be a variable of the continuous variation type, with a range of 0.4 magnitude and a period of 5.4 days. Observations of V Lacertæ, V Vulpeculæ, and 108.1905 Capricorni are also recorded. In the case of the last-named, the rise to maximum is very rapid, an increase of 1.5 magnitudes taking place in $1\frac{1}{2}$ hours, and the observations show that this star is probably not of the Algol type.

SUN-SPOT SPECTRA OBSERVATIONS.—In No. 2, vol. xxiv., of the *Astrophysical Journal*, Mr. W. M. Mitchell, of Princeton Observatory, records the results of his sun-spot spectra observations made during the period October, 1905, to May, 1906. Mr. Mitchell found that during the more recent observations the number of "weakened" lines in the spot spectra has increased considerably; many lines previously recorded as "reversed" are now "weakened," and new lines of the latter type are recorded. A suggestion that this change may be a result of the passing of

the sun-spot maximum awaits the confirmation of further observations. Numerous cases of abnormal "reversals" are referred to in the paper. From the observations of reversed lines Mr. Mitchell deduces a temperature for the gases producing these lines of 4700° , and a further deduction gives 0.38 as the ratio of the sun-spot radiation to the radiation from the unaffected photosphere. The spectrum and construction of the chromosphere are also discussed at some length.

CONDENSATION NUCLEI.¹

PROF. Barus has written more upon the subject of condensation nuclei than any other physicist. In the present memoir, as in those which have preceded it, he arrives at conclusions which are not in agreement with the work of others who have investigated the properties of ions and nuclei. If his investigations are to be trusted, the determinations which have hitherto been made of the charge carried by the ions by means of the condensation method must be regarded as quite untrustworthy. The matter is of sufficient importance, therefore, to justify an examination of Prof. Barus's methods.

The first three chapters, and the greater part of the sixth and concluding chapter, are concerned with experiments upon the production of clouds by the sudden expansion of dust-free air initially saturated with water vapour, the air in most cases being exposed to the action of X-rays or radium. As described by Prof. Barus, the phenomena are exceedingly complicated and irregular. This is not surprising, however, being largely a result of complication in the experimental conditions.

The expansion was brought about by suddenly opening communication between the "fog chamber" and another much larger, partially exhausted vessel, a measured fall of pressure being thus produced. By means of the coronas formed, an estimate was obtained of the size, and hence indirectly of the number of the drops; filtered air was then re-admitted to bring the pressure back to that of the atmosphere. This method of effecting the expansion is not a suitable one for investigations of the kind attempted. For the rate of fall of pressure must diminish as the expansion approaches completion; it is probable that with a suitable width of connecting tube no great error will be introduced into the measurement of the least expansion required to produce a cloud (i.e. that the expansion may be made practically adiabatic), but it is unlikely that the maximum degree of supersaturation resulting from expansions greater than this approaches at all closely to that calculated from the pressure fall. For the condensation on the nuclei which first come into action will, by reducing the amount of vapour remaining uncondensed and by the heat set free, prevent the full supersaturation corresponding to the pressure fall from being attained. The larger the number of easily caught nuclei, the more will the maximum supersaturation attained fall short of the theoretical. The method is thus not a suitable one for obtaining information about the number of nuclei corresponding to various degrees of efficiency.

If we produce a cloud in dust-free air upon nuclei which require a high degree of supersaturation to make water condense upon them, the drops which are formed, if caused to evaporate by compression of the air, appear to leave behind nuclei requiring only a slight supersaturation to make water condense upon them. Unless these are removed before expansions large enough to catch the original nuclei are again attempted confusion is sure to follow. The result of neglecting this precaution is not merely that these residual nuclei give rise to drops as well as those under investigation, but unless the apparatus is such as gives exceedingly efficient expansion the supersaturation necessary for the capture of the nuclei under investigation may not be attained, the number of drops produced being thus too small in contrast to what might at first sight be expected. The experiments of Prof. Barus's investigation were performed under conditions which made this effect

¹ "The Nucleation of the Uncontaminated Atmosphere." By Prof. Carl Barus. Pp. 152. (Published by the Carnegie Institution of Washington January, 1906.)